

CALIFORNIA AIR RESOURCES BOARD
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**APPLICATION OF THE GLOBAL POSITIONING SYSTEM (GPS)
TO THE COLLECTION OF VEHICLE DYNAMICS DATA**

By

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Fifth CRC On-Road Vehicle Emissions Workshop
San Diego, April 3-5, 1995

Abstract

The objectives of this feasibility study were twofold: 1) to assess the accuracy of the Global Positioning System (GPS) in measuring vehicle speed, acceleration, altitude, and road grade; and 2) to identify the limitations and applications of GPS to instrumented vehicle studies and mobile source emissions modeling. A vehicle already equipped with a conventional data acquisition system (DAS) was instrumented with a SGPS and a DGPS receiver. A route for which grades were well known, based upon surveyed maps, was driven repeatedly and second-by-second data collected using the DAS, SGPS, and DGPS. It was found that the SGPS and DGPS receivers measure vehicle speed to within 2 MPH of the DAS. Calculation of vehicle acceleration based upon speed yielded only reasonable correlation with the DAS, as indicated by r^2 s of 0.847 and 0.604 for the SGPS and DGPS data, respectively. The value of differential correction was apparent in the measurement of altitude where the DGPS receiver measured altitude to +/- 10 feet of the expected value as compared to +/- 200 feet for the SGPS receiver. The distribution of grades estimated using the DGPS, based on the altitude measurements, correlate well with the known distribution of grades for the route driven. Based on this study, possible applications of GPS to mobile source emissions modeling include measurement of grade, spatial allocation of emissions, and distribution of trips as a function of facility type.